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ORIGINAL LECTURES.

A LECTURE

ON EPIDEMIC OR MALIGNANT CHOLERA.

BY ALFRED STILLÉ, M.D.,

Professor of the Theory and Practice of Medicine in the University of Pennsylvania.

UNTIL 1830, the inhabitants of Europe and of America were in the habit of regarding the stories of terrible epidemics which devastated Europe in the Middle Ages as belonging to the history of a time which had only a remote, and merely intellectual, interest for the present generation. But a pestilence as terrible as any which the annals of our race record was soon to sweep like a deluge of desolation across the world. On the 9th of August, 1817, it began its death-march at Jessora, a city of Hindostan, whence it advanced to Calcutta, Madras, and Bombay. In the following year it reached the Eastern Archipelago, and in the island of Java, alone, decimated the entire population. Thence it spread into China, and in the course of 1820 entered the northern capital, Pekin. About the same time it began its western progress, ravaged Persia and Arabia, and in 1822 extended as far west as Tripoli, on the shores of the Mediterranean Sea. In the following year the disease showed itself on the northern shore of the Caspian Sea, where it subsided, and appeared for a time to have suspended its progress, for until 1829 we hear no further of its ravages. The pestilence seemed rather to have retired to its original lair upon the banks of the Ganges. But in 1829 it again broke forth upon its old track, eastward and westward, and in the following year we find it raging again around the shores of the Caspian. But this time it did not pause there. It invaded Russia, destroyed more than four thousand persons in Moscow in the space of two months, advanced to St. Petersburg, Warsaw, and the Baltic ports, and appeared in Berlin, Vienna, and Hamburg at the close of 1831. Early in the following year it invaded Great Britain at its northern part, and, while spreading through this and the neighboring island, broke out in Paris on the 26th of March, and spreading throughout France destroyed 120,000 persons in the course of the year. The steady progress of the pestilence westward rendered it probable that it would soon pass the ocean and visit our own shores. Anxiety and dread filled the hearts of the population, and in all directions the municipal authorities prepared to remove the causes which were supposed to favor the development of the disease. It soon became evident that these apprehensions were far from premature. The first case of cholera on the American continent occurred at Quebec, on the 8th of June, 1832, and the disease had reached New York by the 24th of the same month. In the course of a year it destroyed 3500 inhabitants of that city. It was introduced into

Quebec by five vessels from Europe, which had together lost 179 passengers by cholera during the voyage.

"All these ships and their passengers were quarantined at Grosse Isle, a few miles below Quebec. On June 7 the St. Lawrence steamer *Voyageur* conveyed a load of these emigrants and their baggage, some to Quebec, and the majority to Montreal on the 10th.

"The first cases of cholera in America occurred in emigrant boarding-houses in Quebec on the 8th, and the same pest steamboat, the *Voyageur*, landed persons dead and dying of cholera at Montreal, a distance of two hundred miles, in less than thirty hours; and over this long distance, thickly inhabited on both shores of the St. Lawrence, cholera made a single leap, without infecting a single village or a single house between the two cities, with the following exceptions: A man picked up a mattress thrown from the *Voyageur*, and he and his wife died of cholera; another man fishing on the St. Lawrence was requested to bury a dead man from the *Voyageur*, and he, his wife and nephew died. The captain of a passing boat requested an Indian to bury a man from on board; this and five other Indians were attacked and died.

"The town of Three Rivers, half-way between Quebec and Montreal, forbid steamers to land, and escaped for a long time.

"From Montreal the great influx of emigrants was forwarded away, by the Emigrant Society, as fast as they arrived, and by them the pestilence was sown at each stopping-place. Kingston, Toronto, and Niagara soon became affected. In the end over 4000 persons died of cholera in Montreal, and more than an equal number in Quebec."

From the points mentioned the epidemic extended first to Philadelphia, Baltimore, Washington, and the Southern cities generally. In 1833 it broke out in the West Indies, and thence invaded the towns upon the borders of the Gulf of Mexico. In the following year it prevailed in the provinces on our northern borders and in the State of New York, and spread over the whole country during 1835 and 1836. From this period it rapidly subsided, and, although for a year or two cases occurred here and there, the disease had no longer an epidemic character, nor was it of a malignant type. Gradually it disappeared, and the impression became general that we had done with the formidable invader. For nearly ten years this consolatory reflection was entertained; but towards the close of that period the certain though distant signs were visible of its return to our shores.

In 1845 it was known to be advancing on its former path, which it steadily pursued, and entered England in October, 1848, at Sunderland, the very town at which it first appeared in 1831.

"During the second epidemic in Europe, in 1848, two vessels sailed from Havre, where cholera prevailed; one the *New York*, for New York, and the other the *Swanton*, for New Orleans. Both contained large numbers of German emigrants. On one the cholera appeared when sixteen days out, with

fourteen deaths; on the other in twenty-six days, with thirteen deaths. The New York arrived at Staten Island, December 2, 1848, and a severe epidemic broke out, but was confined to the Quarantine grounds. The Swanton arrived at New Orleans, December 11; no quarantine was instituted, and in two days patients were taken into the Charity Hospital. This was the beginning of a severe epidemic, which increased in power all winter, till in June, 1849, 2500 died of it in New Orleans. December 20, 1848, it reached Memphis, by steamboat from New Orleans, where for twenty-five days it was confined to the landing-place, but then spread. In the spring it was carried to St. Louis and Cincinnati and the whole Mississippi Valley. In October it reached Sacramento, by means of overland emigrants, and almost at the same time by the United States steamer *North-erner*, from Panama. The Chinese of California suffered most severely."

In the following April (1849) it reappeared in the public stores at the Quarantine station, Staten Island, and in the succeeding month in the city of New York. From New Orleans in the South, and New York in the North, the cholera spread over the continent, and was even more destructive than during its first invasion. In New York City alone the deaths exceeded 5000. Another pause ensued, which was not broken until the spring of 1854. As before, the starting-point of the epidemic was in Asia. In Teheran, a city of Persia, 11,000 persons perished. It ravaged the South of Europe, destroying an incredible number of victims. At Messina alone upwards of 12,000 are said to have fallen. In France nearly 114,000 were cut off during the year, and in England about 16,000.

Cholera patients arrived at New York in the month of May, 1854, from Europe, and the epidemic straightway commenced. It prevailed during about three months, and destroyed nearly 2000 persons. In Philadelphia during the same period the mortality exceeded 500. I need not trace the further progress of the epidemic, which in this country was less fatal than that of 1849: suffice it to say that it extended to many towns in New England and westward, along the great channels of immigration, through the United States and Canada. Thirteen hundred persons perished at Montreal, and in the small town of Detroit the deaths amounted to 1000.

Once more (December, 1864) the pestilence went abroad. The immediate occasion of its dissemination appears to have been a great Mohammedan festival which was held at Mecca in the spring of that year. Thither several hundred thousand pilgrims flocked from every part of Turkey and Southern Asia, and large numbers among them, even before reaching their destination, died of cholera. There is no doubt that the disease was carried along with the vast crowd which issued from the region where it is endemic,—the great peninsula of Hindostan,—and by them was disseminated in Arabia and Egypt, whence it advanced along the great highways of travel and commerce into Europe. On the 11th of May the

first case occurred in Alexandria, and thence it was carried to Ancona, on the eastern shore of Italy. From Alexandria also it was transported to Constantinople, where it began to prevail July 13. By the end of August it had spread to Malta, Tripoli, Barcelona, and Gibraltar. On the 11th of September it broke out at Marseilles, whence it advanced to Paris on the 25th of the same month; while from Gibraltar it was carried to Southampton, where the first cases of the disease occurred September 27. Seventeen days later it began to appear in London. Finally, on November 2 the steamship *Atalanta* arrived at Quarantine in the Bay of New York, with fifteen passengers sick with cholera. This vessel was crowded with emigrants from Switzerland and Germany, who had reached Havre by the way of Paris, where cholera then prevailed. The disease did not spread at the Quarantine station nor in the city of New York.

In 1867 the cholera again prevailed in this country. Starting from two points, New York and New Orleans, where it had been introduced from Europe, it followed the lines of travel, and could in many instances be distinctly traced to the movements of persons affected with the disease.

This imperfect sketch will give some idea of the progress of epidemic cholera, and of the devastation committed by it, which falls but little short of that produced by the "*plague*," the "*black death*," and other mortal epidemics. Indeed, its ravages far exceed theirs, if the number of places where the cholera prevailed, and the results of its havoc in all countries, be considered. All other epidemics, except influenza, have been comparatively partial and local in their action: this alone has the world for its arena, and takes its victims throughout the whole human family. So mighty a foe it is that you may be obliged to meet. The experience of the past renders it all but certain that some of you will be called to the performance of this duty; and I therefore shall endeavor to prepare you for the fight, by disclosing the nature, the habits, and the vulnerable points of the enemy, that you may be enabled to exclude it from your neighborhood, or conquer it if it should succeed in entering.

CAUSES.—The first question which naturally presents itself in entering on the study of the disease relates to the *causes* which produce it. We should first answer the question, What causes do *not* occasion it? Thus, we may be sure that all possible combinations of natural causes, heat and cold, dryness and moisture and electricity, have existed in Europe and America from the beginning; yet they never developed cholera. Neither did any of the more accidental causes, such as famine, or war, the filth, the crowding, or the misery of the poor, the luxury or the voluptuousness of the rich, or the sensuality of all classes. The essential cause of cholera, like the cause of smallpox or of yellow fever, is specific. Yet we may inquire what circumstances favor the generation of the disease, what influences promote the development and propagation of its specific germs or morbid poison.

HEAT.—A high temperature is undoubtedly one

of the most efficient among the causes which favor the dissemination of cholera. Its origin in the hot climate of Hindostan, and its general progress, prove this conclusively. In nearly all of the places where there is a great difference between the summer and the winter temperature, the disease has disappeared during the cold season, and attained its greatest intensity during the hot months of the year. In this country, at least, the rule is, I believe, without exception. Like yellow fever and miasmatic fevers, cholera shrinks and vanishes at the touch of frost.

The only apparent exception to this statement is the fact that cholera has prevailed in several cities of Russia during the winter. But this very exception confirms the rule; for in Russia the intense cold of the winter compels the inhabitants to seal their houses by every possible means, while the atmosphere of their interior is kept at a high temperature by huge stoves which render ventilation unusual, if not impossible.

The state of *moisture* or *dryness* of the atmosphere, its electrical condition, the prevalence of certain winds, etc., have been held to be conditions adapted to develop cholera. But none of these influences, taken in their largest sense, have been proved to exert a positive power in generating the disease. All kinds of weather, except the very cold, have been known to coincide with epidemics of cholera.

At the same time, I should mention that in London, and I believe that other places furnish similar illustrations, the mortality was in direct proportion to the lowness of the soil and its proximity to the river. But, when it is recollected that it is in these low and damp districts that the most squalid poverty and the densest population of the English capital exist, too much influence must not be allowed to the atmospheric cause; but, on the contrary, its full weight should be given to the depressing and deleterious action of want, filth, and vice. Wherever the streets are *dark*, *narrow*, and *filthy*, the houses crowded, and the inhabitants ill fed and ill clothed, the mortality of cholera is at least one-half greater than in districts whose inhabitants are surrounded by the comforts of life. In the United States I suspect that the difference between the two classes is even greater. It must be acknowledged that occasional exceptions to this rule have been observed, but not enough to invalidate it, nor to lessen our obligation to cleanse our houses when threatened by a visit from the pestilence; for most frequently it passes by clean and dry places to revel in filth and reek.

Another cause inseparable, almost, from the conditions which have been considered is intemperance in the use of intoxicating drinks. Wherever cholera has prevailed, its easiest victims have been drunkards; and, as the number of these degraded beings is greatest among the very poor and the vicious, the mortality of such classes of persons by cholera has always been excessive. It is unnecessary to cite illustrations in proof of a fact which is notorious and unquestionable. I must not be understood to say that the use of alcoholic drinks during cholera

epidemics is necessarily injurious. On the contrary, I believe that such use of them as sober and Christian men may make is rather a preservative against the infection, as well by enabling the stomach to digest food more perfectly, as by promoting a degree of cheerfulness which is by no means the least efficient of the preservatives against the disease. A hopeful and happy disposition is generally thought to be as strong a shield against cholera as despondency and affright are believed to be an invitation to its attacks. It has been said in opposition to this view that the disease has been peculiarly fatal to the inmates of insane hospitals, who are supposed less liable than other persons to panic. But the objection is not valid. Of the insane, a large proportion are monomaniacs, and have at least as lively a sense of danger from an epidemic as other persons. Besides, the feeble bodily health, and the mental despondency of many more, render them peculiarly easy victims to all depressing diseases, and therefore in the last degree to the exhausting attacks of cholera, and indeed of all epidemics.

The quality of the *food* exerts a decided power in determining the attack. The coarse or scanty diet of the poor is no doubt to be added to the other causes already pointed out which operate unfavorably upon this class of society. It has also been observed that that form of diet which occasions attacks of sporadic cholera is most apt to favor the development of the malignant form,—to wit, exclusively vegetable food, particularly in its fresh or uncooked state, unripe fruits of all kinds, everything which is itself acid or tends to become so in the stomach, indigestible substances, such as pork, pickles, and salt provisions generally. The influence of a too exclusively vegetable diet in augmenting the mortality of cholera is perhaps shown by the enormous number of deaths which have occurred among the natives of Hindostan as compared with those among the European population in the same country. But too much importance is not to be attached to this circumstance; for in Ireland, where the use of a vegetable diet is so general, I cannot learn that the mortality from cholera has been unusually great.

The propagation of cholera is, however, due essentially to but one cause: *CONTAGION*. It must be understood that contagion may be *direct*, as where disease is transmitted immediately from one person to another; or *indirect*, as where the clothing of the sick, their faecal and other discharges become the media through which the contagious germs are conveyed. Moreover, this indirect contagion may take place through the air that is breathed, or through the water that is swallowed, and therefore through channels which may be quite unsuspected of carrying it.

The question we have to solve is this:—Does cholera, outside of the locality in Hindostan where it originally prevails, give rise to other cases of the disease? If examples of this sort can be produced in any considerable number and perfectly authenticated, the question is decided. One that occurred under my own observation is the following: Years ago a severe and fatal epidemic of

cholera broke out in the Philadelphia Almshouse. The resident physicians were abundantly occupied in the ordinary care of the sick, and five or six young gentlemen were invited to take charge of the cholera patients. These patients were removed from the several parts of the house where they were originally attacked, to a building in the centre of the quadrangle, and were there attended by the physicians from the city who had volunteered their aid. Three or four of these physicians were attacked by cholera, and one of them died. At this time there was no cholera at all in the city, and the young gentlemen had, therefore, no predisposition to the disease. They were attacked while rendering their services to the sick; while the other, or resident, physicians of the house, did not suffer. Now, the only difference between the position of the two sets of physicians was that the one was in constant communication and contact with the cholera patients, and the other was very rarely so. I think, then, the inference is inevitable that the disease was, in this case, communicated from the sick to the well.

Dr. Alison, the eminent professor of Edinburgh, has published still more unequivocal instances, in which persons having left a place where the cholera prevailed for one in which no case of it had occurred, were there seized with the disease, and those in immediate attendance on them were also attacked. Yet the cholera did not extend in these places, and in fact no other cases occurred there at all during the rest of the epidemic. Similar examples have been related of the propagation of the disease in this country.

Other facts demonstrating the contagiousness of cholera may be cited like that at the Philadelphia Almshouse, and even stronger than it. *E.g.*, in 1832 the cases of cholera in Edinburgh were in the proportion of *one* to every *twelve hundred* of the population of the city; while among those in attendance *on the sick* the proportion was as *one in five*. In 1848-9, *one-fourth* of the nurses employed in the cholera hospital took the disease, while in the general hospital, "only a few paces distant," where no cholera patients were received, not a single attendant was attacked.

It has been again and again observed that persons employed to wash the body- and bed-linen of cholera patients have suffered in a much larger proportion than other persons of the same social condition engaged in different occupations. The introduction of the disease by a single ship among a previously healthy population is a fact which has been repeatedly observed. Thus it was that cholera entered Constantinople in 1865. A ship having cholera on board reached that port the first week in July, 1865; thence the disease passed into the hospital, where thirty fatal cases soon occurred; and from the hospital it passed into the city, where it soon became epidemic.

But the disease is communicated by contagion, less evidently indeed, but none the less certainly, whenever the discharges from cholera patients contaminate water which is used by healthy persons for drinking. This has happened again and again. In

London there was a certain well into which the contents of a sewer had been percolating for months. Of the water of this well hundreds of persons had been drinking without any obvious injury. At last a case of cholera occurred near by; the dejections were thrown into a privy which communicated with the sewer and indirectly with the well, whereupon more than five hundred persons who received water from that particular well were attacked within three days.

Again, at Constantinople, in 1865, the clothes, mattresses, etc., of cholera patients were washed at a fountain, the basin of which was divided into two parts by a parapet wall; one part was used for washing clothes, and the other for drinking-purposes. Unfortunately, the waste-pipe being broken, the foul water of one side communicated with the clean water of the other, and in one day sixty people died in the small portion of the city which was supplied by the infected stream.

These facts, and countless similar ones, confirm the belief which is suggested by the symptoms of epidemic cholera, their essential identity with those of the sporadic form, and the condition of the alimentary canal after death,—that the material cause of the disease is a poison received into the body by the mouth and stomach, and that the only demonstrable agent in the dissemination of the disease consists of a specific poison contained in the alvine evacuations. It seems difficult to admit that the poison is *atmospheric*,—*i.e.*, inherent in the atmosphere, and not merely absorbed into it from the sick and their excretions; for we are acquainted with no facts whatever which prove the disease to have originated independently of previous cholera patients, or their dejections conveyed by clothing, water, air, or other possible vehicle. Nor has the atmosphere revealed any constituents, or conditions, during cholera epidemics, different from those of the healthiest seasons.

On the contrary, the whole history of cholera shows that it advances from point to point, wherever the *men or things* infected with it are carried; by gradual and short steps on land, as by caravans, or armies, or individual travellers, but with vast strides across seas and oceans, when it is conveyed in ships. Highways and railroads and river-courses mark out its path across continents, because in these the throngs of men are thickest, and continue, like the links of a chain, the long procession of cholera victims which had its beginning in the jungles of Hindostan. Seaports are its favorite halting-places; because in them infected ships and crews congregate. Great cities furnish its most numerous victims; because in them are the very hotbeds in which tens of thousands of human beings are perpetually kept upon the narrow verge which separates disease from health, and where the water, the air, the food, may all readily become contaminated by the germs of the pestilence and spread it through a thousand channels.

This dissemination from man to man, directly or indirectly, is sufficient to account for the spread of cholera; and it is unnecessary to invoke besides, as some persons do, an undemonstrated and occult

condition of the atmosphere which predisposes men strongly to be affected by the emanations from the sick, their excretions and clothing.

We may conclude that cholera is contagious, and that its contagious element is disseminated by whatever can carry a material poison: by bodies of men and by individuals; by ships and by clothing; by winds and by water, by dust and by food; and that the germs of the contagion are contained in the alvine evacuations and in nothing else. The probable nature of those germs we shall have occasion to speak of again.

SYMPTOMS.—The symptoms of cholera are usually divided into three stages: 1. the *forming* stage; 2, the *cold* stage; and 3. the stage of *reaction*. Such a division is natural and proper, because the disease may terminate in any one of these periods: in the first, by an arrest of the attack; in the second, usually by the death of the patient; in the third, by his convalescence.

THE FORMING STAGE, or stage of *invasion*, may be marked in some cases by a *sudden*, and in others by a *gradual*, development of symptoms. In the former the patient is seized with a general depression of all the faculties of mind and body. The senses are irritable, the head aches and is confused, there is a disinclination to sleep, the limbs totter under the weight of the body, the pulse is frequent and feeble, occasionally fainting takes place, and the skin is cool, and moistened with perspiration. When the attack is more gradual, the earliest symptoms are usually abdominal. Wandering pains are felt in that region; it is distended with flatus, and emits rumbling noises; there is more or less nausea, and a discharge of thin, yellowish, and offensive stools, which gradually grow lighter in color and more frequent. At the same time, the general debility and prostration are remarkably great, and sometimes slight cramps are felt in the limbs. This condition is of variable duration. Sometimes it precedes the full development of the attack by a few hours only; in other cases it lasts for a week or ten days before the graver phase of the disease appears. It is during this stage that the treatment of cholera is most successful: indeed, *it is the only stage in which we can rely upon the effects of remedies*.

The succession of the early symptoms, and the duration of the first stage, are generally such as I have described. But cases now and then occur in which the whole of these phenomena follow one another within the brief space of one or two hours. The patient is stricken down with sudden feebleness, is seized with profuse vomiting and purging and general spasms, and dies without any interruption of the symptoms or any tendency to reaction.

But, more generally, after a greater or less duration of the first stage, the **SECOND OR COLD STAGE** is ushered in by a marked aggravation of all the symptoms. The discharges of fluids from the stomach and bowels grow incessant and more abundant, and vary from ten or twelve to twenty or even more in the twenty-four hours. They are usually passed without effort, and consist of a large quantity of serous liquid, at first somewhat tinged yellow with

bile or fæces, but afterwards whitish or grayish, like rice-water, and containing flakes of coagulated fibrin or the *débris* of the intestinal epithelium. In a few instances the stools are tinged with blood.

Vomiting usually coincides with the copious purging. After the food which the stomach may happen to contain is thrown up, large quantities of a whitish or milky-white fluid, exactly like what is discharged from the bowels, are evacuated; more frequently, however, this fluid is at first tinged with bile. It is poured forth, less by the ordinary act of vomiting than by gushes, as if it overflowed from the throat and mouth; and it often escapes from the stomach and bowels at the same instant. Sometimes a distressing hiccup accompanies these symptoms. It is, indeed, but one of the spasms which affect the whole muscular system. They usually commence in the fingers and toes, seize upon the muscles of the calf of the leg, and render the muscular wall of the abdomen as hard as a board. The pain which they produce is extremely severe. At this period the debility is extreme; the patient is unable to rise, or even to move at all, except under the stimulus of the spasmodic pain. The features are shrunk; the nose is sharp and pale and bent to one side. The dusky and sunken eyes, the thin lips, the hollow cheeks, and contracted muscles that stand out like cords under the tight and clammy skin, present a physiognomy such as belongs to no other disease. The hands and feet grow cold, and steadily the coldness creeps upward towards the trunk; the integuments of these parts are shrivelled and damp, as if they had been long macerated in water; and, if they are pinched up, the fold of the skin remains for some time. The eyes grow dull and dry, the tongue has a pasty or sticky feel, the urine is almost suppressed. As the attack advances, the patients fall into a dull, listless, and motionless state, which must not be mistaken for insensibility, but which arises from complete muscular exhaustion and a want of energy in the cerebral and spinal functions. They express no interest in anything, and hardly notice the attentions or the distress of their friends. Yet they will generally give clear though languid answers to questions, and fall again into their inert and unobservant state.

As these symptoms advance, as the fluids of the body are wasted away, the blood accumulates and stagnates in the veins, and gives to the hands and feet, the nose and lips and other features, to the neck, and even to the entire surface of the body, a bluish, leaden, or violet tinge, precisely like that of cyanotic children. The pulse, which was already weak and thready, ceases to be perceptible; the carotids, even, can no longer be felt; then the impulse of the heart ceases, and its first sound becomes inaudible. The skin is everywhere cold, is sometimes of an icy coldness, and yet the patients seldom complain that it is so. Even the breath as it issues from the nostrils is cold.

The blood no longer circulates, and the heart is still. If a vein is opened, a few drops of black and viscid fluid trickle from the wound, and, if they coagulate, yield but little serum, and, in place of a clot, nothing but a diffuent jelly. The voice falls to a mere whisper, or is quite extinct. The features

assume a horrid aspect: the temples and the cheeks are hollowed; the nose is pointed, and the nostrils are obstructed with dry powdery crusts; the eyes are dry, dull, and sunken behind the half-closed and purple lids; the conjunctiva is no longer moistened by its secretion, and grows bloodshot; the temperature of the mouth may fall to 79° or 80° ; a viscid exhalation bedews the icy and marbled skin; and the whole body is so shrunken from its natural proportions as to lose all marks by which its identity may be usually recognized. From this pulseless, cyanotic, cold, and exhausted condition there can be but one step to death. It generally comes on gradually, the patient sinking into complete insensibility; in other cases he expires suddenly upon making some unusual effort.

REACTION.—At any period of the progress which has been described, the contest between the system and the disease may be decided in favor of the former. If this takes place in the early stage, before there is any blueness of the skin or any very profuse evacuations, the recovery may be gradual and without remarkable phenomena. The pulse regains, more or less, its natural force; the skin grows warm again, first upon the trunk and afterwards upon the extremities; the breathing becomes easy, and, the diarrhoea having already ceased, convalescence is established. But in proportion to the violence of the symptoms, the intensity and duration of the cold stage, the cramps, and the evacuations, will be the tendency to an opposite extreme upon recovery, a tendency to febrile reaction, accompanied with more or less congestion of internal organs. The first sign of improvement is the subsidence of the evacuations, of the vomiting, and then of the purging, or, if the diarrhoea continues, it loses the characteristic appearances of cholera, and is more or less brown; the next step is the diminished coldness of the extremities; then the improvement of the pulse; and finally the restoration of the strength. Or, if the attack has been severe, particularly if the algid stage has been prolonged, fever of a low form is set up, which, indeed, may ultimately terminate in death. It is marked by dryness of the tongue, a brown crust upon the teeth and gums, jerking of the tendons, delirium, and coma; in one word, it is a typhoid state. Sometimes these symptoms are evidences only of exhaustion and of the inability of the system to resume its normal action; in other cases they appear to be due to a local inflammation of low grade established generally in the lungs, and which is usually latent. In other cases, again, the nervous system bears the brunt of the reactionary effort, and the patient is attacked by convulsions or perishes in an apoplectic fit. These phenomena appear to be due in most instances, if not in all, to renal obstruction, by which the effete matters of the system which should be excreted by the kidneys are retained in the blood, and the phenomena, as a whole, may be termed uræmic. In other cases a wasting diarrhoea, due probably to the damaged state of the intestinal mucous membrane, is superadded to the already existing typhoid state. Occasionally the parotid glands become enlarged and painful, and sometimes a

measly or roseolous eruption appears upon the skin.

It frequently happens that convalescence is slow and irregular. The system seems shattered by the trial it has passed through; the nervous susceptibility remains morbid for a long time, or, what is still more usual, the function of digestion is greatly impaired. The appetite is capricious and the digestion feeble. The mouth is pasty, the abdomen tympanitic, the bowels are irregular and alternately confined and relaxed. Finally, patients who leave their bed too soon, or indulge prematurely in their ordinary diet, are liable to relapse, perhaps fatally, into the original disease. In fact, it has occasionally happened that such a relapse has taken place several days after an apparent restoration to perfect health.

ANATOMICAL CHARACTERS.—In cholera, as in most other diseases, the pathological condition of the organs does little more than explain the effects of the disease properly so called: it reveals the mechanism by which the secret and inscrutable essence of the disease produces its ultimate effects, but it throws very little light upon the nature of that essence or efficient cause. But at the same time it leads to a probable conjecture of the primary element in the derangement of the organism, and explains in part, at least, the mode in which remedies which have been found successful in the treatment exert their salutary powers. I shall not attempt to present a detailed and minute account of this chapter in pathological anatomy, but shall draw attention only to its more important divisions.

And, first, of the *blood*. The grosser physical characters of cholera blood, as found after death, are these: As a general rule, the arteries are nearly empty; they sometimes, however, contain a small quantity of black and viscid blood. The veins and the right side of the heart are filled with dark blood, which is in general very imperfectly coagulated, and often fluid; even when clots are formed they are for the most part soft, and resemble blackberry jelly. The veins of the brain are usually gorged with liquid and black blood, and the same is true of the veins of the small intestines. The red globules themselves undergo important changes. They have lost their watery constituents and become shrivelled and irregular in shape, and may even be completely disintegrated. Such is the usual state of the circulating fluid; but some observers have found firm clots within the heart, more or less deprived of coloring-matter, forming true fibrinous coagula. Still, this condition is undoubtedly of infrequent occurrence.

Similar changes are found in the blood drawn during life. Owing to the loss of water, the proportion of its solid ingredients is relatively increased, so that a given bulk of it weighs more than an equal quantity of healthy blood. In other words, its specific gravity is increased. Thus, the maximum specific gravity of healthy blood is 1060, while that of cholera blood is 1080. The serum of the blood becomes denser than natural, and rises from 1028 to 1040. In like manner, when we come to examine the solid constituents of this fluid we find the proportion of

them all increased. The proportion of red globules rises from 140 to 170 parts in 1000. The fibrin, although its relative quantity does not increase, appears to have undergone important changes, for it coagulates with difficulty or not at all. The albumen, of which the normal proportion is 70, generally falls, and has been found as low as 49 (Becquerel and Rodier), a portion of it having been lost by percolation through the intestinal mucous membrane and by secretion through the kidneys. On the other hand, the fatty and extractive matters, like the globules and fibrin, are augmented, and in even a larger proportion. For normally they average ten parts in a thousand of the blood; but in cholera they rise to twenty, thirty, and almost to forty parts in a thousand. This remarkable circumstance has been attributed to the absorption of the adipose tissue, which is so general and so rapid in this affection. We shall presently see that this fatty matter is poured out through the intestinal tube. In connection with the state of the blood, a singular fact relating to the *temperature* of the body before and after death may here be noticed. In the algid stage all the external portions of the body are unnaturally cold, while the interior, as indicated by the temperature of the vagina and rectum, is above the normal grade; precisely as happens during the cold stage of the algid form of malarial fevers. In those patients who die during the collapse, and very cold, as was before remarked, the temperature of the surface rises one, two, or three degrees in the course of an hour or two; and the body is much longer in cooling than usual. Sometimes, indeed, the friends of the patient are led to hope that life is not altogether extinct. Another circumstance is apt to encourage this hope, or to inspire the ignorant with a mysterious horror. It is the *muscular contractions* observed in various parts of the body. They "vary in extent from flickering and tremulous undulations in a few fibres, scarcely to be seen or felt, to contractions sufficiently powerful to move the limbs from their position or even to displace the body itself." They begin shortly before death, and last a variable time, from a few minutes to two hours. Similar phenomena have been observed in other diseases, and especially in yellow fever.

On opening the *abdominal cavity*, one is struck by the general pink or rose tint of the peritoneal coat of the intestines. It is produced by a hyperæmia of the portal venous system; sometimes the color is very dark, the venous trunks being full of pitchy blood. The serous surface is drier than usual, and often has a sticky feel, from a layer of tenacious glutinous matter, which forms a lather when rubbed between the fingers. This shows it to be albuminous.

The dryness of the peritoneum is a type of the condition of all the tissues, of the meninges, the pleura, the pericardium, the brain, the lungs, the muscles, and the glands.

The *contents* of the intestinal canal vary somewhat in its different portions. In the *stomach* the liquid is generally thin, transparent, greenish or grayish, and occasionally has a tinge of deep red. It some-

times contains portions of coagulated mucus, resembling shreds of boiled rice, and also an unctuous substance which adheres to the walls of the organ and is thought to be modified albumen. Fatty globules have been observed floating in the gastric liquid, as they have also been in the stools and in the urine during life, as well as in the vomit of cholera.

The same serous fluid is found in the *small intestine*, but its color becomes a deeper red, almost of a chocolate shade, in the ileum. At the upper part of the bowel it is thicker than below; indeed, it seems at every step to be diluted by a fresh secretion of liquid from the mucous membrane. The epithelial shreds and patches are more abundant here than in the stomach, and along with them is also found the albuminous matter already described, deposited in a thin layer upon the surface of the bowel. In the *large intestine* the contents do not differ materially from those last described. In some cases the intestinal liquids, "when exposed to a temperature of 212° F., coagulate like the serum of the blood, and yield a similar odor, thus exhibiting the presence of a large amount of albumen." Some observers have failed to observe this effect,—partly, it may be suspected, because they neglected the necessary precaution of rendering the fluid, which is generally alkaline, acid before exposing it to heat; for unless this be done no coagulation will take place. The albumen, too, is often altered in its physical characters, and requires to be boiled with nitric acid before coagulating. The brown or chocolate color of the liquid in the small intestine which is sometimes observed, and which I have already referred to, is due to the presence of the coloring-matter of the blood derived from broken-down, and occasionally to the presence of unaltered, red corpuscles.

The *mucous membrane of the stomach* seldom presents any organic changes. Its tissue is swollen by the infiltration of serum. Its color is usually unnatural; sometimes pale, but more frequently of a rosy or of a purplish red, like certain onion-skins, or else of a dark brownish-red color, which is due to the congestion of the veins in the sub-mucous cellular tissue. When the color is light, hyperæmia is its principal cause; but when it is dark, congestion of the larger trunks and ecchymosis exist. Occasionally this membrane is reduced to the condition of a mere pulp. The same varieties of color are found in the *small intestine*, increasing gradually in depth from the duodenum to the cæcum, being most marked in the lower portion of the ileum, in consequence of the sub-mucous extravasation of blood at this point. Here, as in the stomach, the diffused and brighter redness is found to be due to extreme capillary congestion. But much more important changes are revealed by a microscopic examination. As long ago as the first American epidemic of cholera (1832-35), Prof. Horner, of the University of Pennsylvania, described an exfoliation of the epithelial lining of the alimentary canal, whereby the extremities of the venous system are denuded, as characteristic of cholera alone. And in 1849 Prof. Jackson, Emeritus Professor of the In-

stitutes of Medicine in the University, and Dr. John Neill, then Demonstrator of Anatomy in that institution, in conjunction with the late Dr. William Pepper, and with the late Dr. Goddard, who was also at one time Demonstrator of Anatomy in the University, presented a report to the College of Physicians, in which they, too, showed that "the epithelial layer of the intestinal mucous membrane was either entirely removed, or was detached, adhering loosely." I claim for the University the credit of having made this discovery, whatever may be its value, long before it was announced in Europe. Indeed, it was only in 1860 that the eminent pathologist and microscopist Dr. Beale, of London, arrived at the same conclusion. He says of the rice-water contents of the intestines, "This has been proved to consist almost entirely of columnar epithelium; and in very many cases large flakes can be found, consisting of uninjured epithelial sheaths of the villi. . . . In bad cases it is probable that almost every villus, from the pylorus to the ileo-cæcal valve, has been stripped of its coating during life." The capillary veins being also greatly distended, it is evident that there is no barrier to the transudation of the fluid portion of the blood into the intestine; while an almost insuperable one exists to any absorption from the bowel. The solitary glands are almost always distinct, their prominence and general increase of size being, for the most part, due to the oedematous state of the tissue in which they are contained, but partly also to the presence of a substance which appears to be albumen. The patches of Peyer do not undergo any real alteration, but, like the solitary glands, are swollen by an imbibition of serum. The mesenteric glands are slightly enlarged, and to some extent infiltrated with "a whitish, granular exudation" (Virchow), of undetermined nature, but probably albuminous.

In the *large intestine* are found the same changes of color and consistence of the mucous and sub-mucous membrane as at the upper portion of the intestinal canal, but with much less frequency. The isolated follicles of this, as well as of the upper division of the bowel, are generally prominent, and sometimes extremely numerous.

Neither the *spleen* nor the *liver* presents any special alteration. The *gall-bladder* is generally distended with glairy bile. The *kidneys* are often congested, and the calices contain a large quantity of epithelial scales, which give the urine a turbid appearance in the bladder. The urine is albuminous, as it is found to be in the early stage of the disease. The *lungs* present no other lesions than result from hypostatic congestion; and the *pleurae*, like the peritoneum, have sometimes a sticky feel. The *heart* offers no uniform alteration. The *brain*, too, is unchanged; but the pia mater is infiltrated with serum, which is also abundant in the lateral ventricles; and the cerebral veins are gorged with black blood.

Such is a succinct account of the most important pathological changes in the organism which are produced by cholera. And, now, do they throw any light upon the mechanism of the disease? That its primary cause is material, and acts upon the

gastro-intestinal mucous membrane and upon the organic nervous system, we cannot doubt. The whole history of its epidemic progress proves this to be the case, as well as the lesions found after death. Unlike other epidemic diseases, such as typhus, yellow fever, the plague, etc., we can find no primary alteration of the blood in it, which will throw light upon the succession of the symptoms. These, on the contrary, point to the gastro-intestinal canal as the material starting-point of the morbid processes which develop the phenomena of cholera. All of the phenomena of the complete attack point in the same direction. Most of them succeed upon a profuse flow of the serous and watery portions of this fluid into the bowels. This it is that produces the vomiting and purging; this prostrates the patient, and wastes away, in a few hours, the fullest and firmest form; this chills the extremities and afterwards the trunk; this thickens the blood, so that the capillary vessels refuse any longer to convey it, and spreads its cyanotic shadow over the whole surface of the body; this cuts off the supply of blood from the heart; this paralyzes the nervous system, organic as well as animal; this obstructs the kidneys and arrests their secretion; and this, therefore, acting through the various links of the pathological chain, *is the cause of death*.

But what is the remoter cause of cholera? What sets in motion these successive wheels which end in crushing out the life of the cholera victim? Evidently, something received from without and swallowed. One opinion is that it consists of certain microscopic fungi, or their germs, which, on being received into the bowels, propagate their kind and destroy the epithelium. It is believed by some that this fungus takes its origin on the banks of the Ganges, and that it is produced upon the rice-plant. Having once originated the disease, its germs contained in cholera dejections, being mixed with water or borne upon the wind, enter the system of new victims, who, in their turn, disseminate the plague. Another theory is (Richardson) that, "as pus undergoes changes which convert it into a septic poison, so the excreted matter from the alimentary canal is equally capable, under peculiar conditions of oxidation, of producing an alkaloidal organic poison, which, soluble in water, but admitting of deposit on desiccation," becomes the agent for the dissemination of the disease. The former is the more generally accepted opinion, and seems to be supported by many facts; but the latter has numerous supporters and many facts also in its favor. Opposed to the latter theory, however, stands the insuperable objection that outside of Hindostan epidemic cholera never did and never does arise spontaneously, but can always be traced to its source in that country. Consequently, there must be in the disease a certain specific something,—whether a cryptogam or not is of subordinate importance,—an essential material, capable of propagating itself in the alimentary canal of human beings, of exciting there certain definite lesions and symptoms, and of communicating to the alvine discharges the property of occasioning the disease anew.

In what does sporadic cholera differ from malig-

nant epidemic cholera? Only in its cause and its degree. Its mechanism is the same. Yet sporadic cholera is a disease of the stomach and bowels usually produced by the direct application of irritants to their surface. This no one doubts. Wherefore it seems but rational to conclude that epidemic cholera is also an intestinal disease, which differs from the sporadic form chiefly by the intensity of its cause, the gravity of its symptoms, and the nature of the special cause which produces it.

(To be continued.)

ORIGINAL COMMUNICATIONS.

SULPHURIC ACID AS A PROPHYLACTIC IN CHOLERA.

BY ROLAND G. CURTIN, M.D.

THE long-looked for and much-dreaded visitor—the Asiatic cholera—seems to be prepared to spread its dark pall over our land. It is now approaching us by its well-beaten paths in Europe, and also by way of the lower part of the Mississippi Valley, where the poison is nursed by the higher temperature which favors its propagation. In another month it will probably be in our midst, seeking for victims to satiate its rapacious appetite. It therefore behooves us to be prepared for it. How shall this be done? From past experience in other epidemic diseases that have been effaced or robbed of their sting, it would seem that we must look for succor in prevention rather than in cure. It is my intention to give to the profession some experience which I hope may prove to be of value in regard to the prevention of the disease.

Our country was first visited by this unwelcome guest in 1832, next in 1848 and 1849, again in 1853 and 1854, and the last time in 1865 and 1866. During this last visitation I was resident-physician in the Insane Department of the Philadelphia Hospital. The disease had almost entirely disappeared from the city and from all parts of the Philadelphia Almshouse and Hospital, except from the women's wards in the insane department, where it still continued in a very virulent form. Strange to say, it was almost entirely confined to three of the seven wards on the female side of the hospital. It was so persistent that the Board of Health paid the hospital an official visit, but were unable to account for the presence of the disease in particular wards. It is true that the women's apartments were very much crowded, there being three hundred and fifty inmates, but the wards in which it was so prevalent had proportionately fewer inmates than others which almost entirely escaped. During the whole epidemic only two cases occurred in the male wards, while among the females one in every nine was attacked. Sex would not account for this difference, for statistics at large show that male and female lunatics are equally liable to the disease.

I was induced to try sulphuric acid by my friend Dr. James F. Wilson, with gratifying results, if I

may be allowed to judge. Dr. Wilson had read an article in a British newspaper in which the writer stated that the workmen and their families connected with a large factory had been treated with sulphuric acid as a prophylactic during an epidemic of cholera. The correspondent stated in the letter that "the result was that not one man or any of their families were attacked with diarrhoea, whilst around them death took its own course." I caught as a drowning man at this straw, for everything else had been tried and yet the disease continued its ravages. After having concluded to use the sulphuric acid, the next thing was to administer it to all the patients, many of whom were so suspicious that they refused at all times to take medicine, for fear of being poisoned. Knowing that it would be impossible to conceal it in their food or usual drinks, I concluded to administer it disguised as lemonade, and announced through the nurses to the patients that I intended to "treat" the whole institution to lemonade every day, which announcement was well received in general, and by some of them with enthusiasm. The drink was made in this way. About twenty drops of the dilute sulphuric acid were mixed with four ounces of water and sweetened with white sugar. Some oil of lemon and a few cut lemons greatly assisted in the disguise. What followed the administration of the sulphuric acid can best be shown by the notes taken at the time. The diary was begun on August 20, 1866, before which time seventeen cases had occurred in the insane department.

August 20.—Four new cases.

August 21.—Four new cases.

August 22.—Four new cases.

August 23.—Two new cases. Board of Health visited the hospital.

August 24.—Five new cases.

August 25.—One new case. Acid given for the first time, in the afternoon.

August 26.—Four new cases *during the night*, within twelve hours after the first administration of the acid.

August 27.—No new cases.

August 28.—One new case,—a woman who refused to take the acid.

August 29.—No new cases.

August 30.—No new cases.

August 31.—No new cases. The acid was discontinued.

September 1.—No new cases.

September 2.—Two new cases,—two days after the suspension of the acid.

September 3.—No new cases. Acid resumed.

The acid was continued for some time, and no more cases occurred.

It will be seen by the above diary that up to the time of administering sulphuric acid the disease was pursuing a steady course in the female department. It is true, and should be here stated, that every means had been tried to banish the disease, such as ventilating and cleansing the wards, spreading disinfectants, scattering the patients by using the large sewing-room for a sleeping-ward, attention to diet, etc., but without apparent effect. The acid was first given on the 25th of August and continued until the 31st. Four cases occurred *within*

twelve hours of the time when the acid was first given. After this only one case occurred while the acid was being used, viz., on the 28th. This was a poor ignorant (?) lunatic, who, upon tasting it, spit it out, and surprised me very much by saying, with great vehemence, "Dochter, ye call this limonade; but ye can't desave me; it's nothing but ile of vitriol." On the 31st of August it will be seen that the "lemonade" was stopped, on account of the exhaustion of the supply of white sugar in the drug-store, as without this sugar it would have been impossible to prepare the acid in such a manner as to insure the patients' taking it. On the 2d of September, *two days after the suspension of the use of the acid, two new cases occurred*, both of which proved fatal. The prophylactic was then resumed, and *no new cases* afterwards occurred in the insane department; but cases continued to arrive from the city until the 1st of November. The use of the acid was continued uninterruptedly for several weeks. My friend Dr. J. F. Wilson gave it to the patients in the surgical wards during the epidemic, and he informs me that the *cholera visited every department of the almshouse and hospital except the surgical wards*.

The question naturally arises, was it the sulphuric acid that arrested the march of the disease? I think it was, for the following reasons:

1. *The prompt disappearance of the disease within twelve hours of the time when the acid was first administered*, the only case arising during its use being that of a patient who refused to receive it. The acid was stopped on the 31st of August, and two days after this two cases occurred. The acid was then immediately resumed, and not a single case occurred afterwards.

2. *The fatality attending the disease*. When an epidemic declines from natural causes, it generally becomes less fatal. Of the four patients attacked on the 26th of August, three died, of whom one was a young, robust epileptic, who lived but five hours after the first symptom; another was a strong lunatic, who succumbed in nine hours. The two cases which occurred on the 2d of September, after the suspension of the use of the acid, both died; thus showing that the type was none the less fatal.

How did the sulphuric acid act? According to Dr. G. B. Wood, it has the following effects upon the system, viz., *tonic, astringent, refrigerant, and diuretic*. It has been largely used in the treatment of the first and second stages of cholera. Dr. Macnamara, in his work on Asiatic cholera, recommends the use of dilute sulphuric acid, in doses of fifteen minims, in the second stage. The celebrated "Austrian Specific" was composed of sulphuric and nitric acid. Nitric acid had been used in India in the treatment of cholera with considerable success. It was tried in England and found to be of no avail, when further investigation proved that the nitric acid of India contained a considerable amount of sulphuric acid. The latter was an accidental product of the manufacture of the nitric acid of India. Hence the use of the combination of these two acids in the treatment of cholera. Elixir Halleri, or liquor acidi Halleri, has been much used in India, and is

ordered as part of the medical stores of the British army there. It consists of sulphuric acid and alcohol. Drs. Buxton, Sansom, and Fuller, of England, used sulphuric acid with success in the first stages of cholera, especially in the choleraic diarrhoea. From the above statements it would appear that sulphuric acid itself has some effect upon the disease; and now we will proceed to discuss its influence as a prophylactic.

It had been noticed that workers in copper were remarkably exempt from cholera, and upon investigation it was found that the air surrounding them was considerably charged with sulphurous acid, which gave rise to the supposition that this was the active preventive agent. This led to the use of sulphurous acid in cholera districts and hospitals, but with what results I have not been able to learn.

Dr. Burg, in reviewing the statistics of deaths from cholera, found that "out of thirty-two thousand artisans in copper, brass, and bronze, employed in Paris and other cities, during the last outbreak of cholera, only sixteen deaths resulted from that disease. Another interesting fact bearing on this question is that the city of Rio Tinto, surrounded as it is by copper-mines, has never been visited by this epidemic."

The sulphurous acid found near these mines proceeds from the smelting-works, in which the sulphurets of copper are generally used; other sulphurets often, being associated with the copper ore, also yield their sulphur to the atmosphere. Still further, it has been noticed that persons living near gas-works are less liable to be attacked than those living remote. Here also we find the atmosphere more or less impregnated with sulphurous gases. Almost all gas coal contains sulphur; and the process of purification in part consists in the removal of the sulphuretted hydrogen. Hence we discover a source of sulphurous gases, which gases may be the protecting agents. It may be, judging from these circumstances, that the cholera-germ is destroyed; for in the case of Rio Tinto, which is surrounded by sulphurous acid, it would seem to form an impenetrable barrier to the cholera. It is a well-known fact that sulphurous acid in the form of a sulphite will arrest fermentation; and it has been suggested that it acts in the same manner upon the zymotic cause of cholera.

But, again, we find that sulphuric acid seems to have an influence over the disease, which would lead us to ask whether the *sulphur may not be the destroying agent of the cholera-germ*, acting as a specific in the same manner that it does in the case of the itch insect. If this be true, the disease may be easily eradicated from a ship or a house or any infected locality by fumigating with sulphurous acid,—simply by burning sulphur; also disinfecting privy-wells and other objectionable places by means of sulphate of iron, and at the same time giving liquid sulphurous acid, sulphuric acid, and the sulphites, by the mouth, to those exposed.

It has already been stated that sulphuric acid may act beneficially independent of any specific action upon the cholera-germ.

I have said that it is a tonic, astringent, re-

frigerant, and diuretic. The vital energies are often very much reduced, digestion is poor, and the intestines and the system at large are in a relaxed condition, the result of the high temperature of summer. Here we find the condition favorable to an attack of cholera. The tonic, astringent, and refrigerant effects of the sulphuric acid would all be eminently indicated by these conditions, and its administration might tide the patient over the period of danger. It may also act beneficially in another way. We all know the depressing effect of fear, which undoubtedly predisposes to cholera. A prophylactic given in such cases would allay the fear and thus ward off the disease. But this latter condition was not a characteristic of the poor lunatics in the Philadelphia Hospital; for many of them knew no fear except that produced by their hallucinations. It is pleasant to have a preventive at hand; but in none of the text-books have I been able to find anything recommended as such in cholera. Having one, we might be able to quiet the fears of the nervous and keep them from the often injurious nostrums of those who prey upon this class.

One thing should be remembered. It is this, that sulphuric acid, when administered for a long time continuously or in too large doses, may give rise to symptoms of intestinal irritation. However, although the acid was given to the lunatics uninterruptedly for several weeks, no ill effects were observed. It should be given only to those who are greatly exposed during an epidemic of cholera; otherwise the above unpleasant effects may be produced.

332 SOUTH SEVENTEENTH STREET, PHILADELPHIA.

A SUGGESTION FOR THE TREATMENT OF APPROACHING COLLAPSE IN CHOLERA.

BY WILLIAM PEPPER, M.D.,

Lecturer on Clinical Medicine at the University of Pennsylvania.

IT is with no intention of discussing at length the causes, pathology, or treatment of cholera that this brief practical article is penned. The investigations into the precise nature of the cholera-poison cannot yet claim to have attained definite and complete results. Nor can it be asserted that any of the various explanations of its *modus operandi*, however ingenious and plausible, affords full and unquestionable satisfaction.

That which is, however, well known and generally accepted in regard to the mode of action of this fatal poison, is fortunately of material value for practical purposes. It may be concluded, at least, that the peculiar symptoms of true cholera depend upon the presence in the economy of a specific virus, introduced often by the drinking-water, though probably also by other avenues, which produces a wide-spread, peculiar irritation of the gastro-intestinal mucous membrane (and probably of associated secreting glands), attended with rapid epithelial proliferation, usually with profuse serous discharges; a special morbid state of the great ganglia of the sympathetic nerve; and serious changes in the

blood-mass. I do not even raise the question (for the precise settlement of which I do not think the data yet exist) as to which of these may be the primary change: whether, in other words, the specific gastro-enteritis is the primary essential condition, and the morbid excitation of the sympathetic nerve, and the blood-changes, secondary and subordinate steps; or whether the alterations of this fluid are the initial phenomena, due to the presence of a poison having a special action upon the sympathetic ganglia, and the gastro-intestinal irritation and the profuse sero-epithelial discharges the result of an effort to excrete this poison; or whether, finally, the virus acts directly and primarily upon the great sympathetic nerve-centres, and the gastro-intestinal changes, the peculiar discharges, the alterations in the blood, and the attendant general symptoms, are consequent upon violently disturbed function.

The symptoms of true cholera,—the formative stage of mere intestinal irritation, cholérine, so called; the stage of characteristic sero-epithelial discharge, with its symptoms of intense gastro-intestinal and reflex muscular irritation; the stage of collapse, with its wide-spread and profound disturbances of respiration, circulation, calorification, and secretion; these are too well known from the exquisite classical descriptions to need repetition. My own belief with reference to the mode of their production is, that while the primary essential condition consists in the extensive and severe irritation of the gastro-intestinal mucous membrane, a very large and important share in the causation of the discharges and the consequent alterations of the blood, and especially of the symptoms of collapse,—the failure of the cutaneous circulation, the condition of the respiration and action of the heart, the arrest of secretions,—must be attributed to the direct or indirect implication of the abdominal and thoracic sympathetic ganglia. There is nothing original in this view of the vastly important rôle played by the sympathetic nerve in the production of the symptoms of collapse,—whether in cholera or other conditions which may closely simulate this phase of that disease, as acute intestinal obstruction or poisoning by some acrid substances. Want of space forbids me to amplify it now. I will merely remark that there seems no reason to doubt that while the direct, continued, and intense irritation of the gastro-intestinal fibres of the abdominal sympathetic might well paralyze them and cause paralytic dilatation of the gastro-intestinal capillaries with free discharges of serum, there might be a wide-spread irritation of less intense degree of the other branches of the abdominal and also of the thoracic sympathetic, producing the arrest of circulation and secretion, the slowing of the heart, and the disturbance of respiration, which contribute to form the stage of collapse.

Certainly for practical purposes we must recognize the presence of the three elements of gastro-enteritis, of irritation of the sympathetic nerve, and of serious blood-lesion. During the formative stage of the disease and the early part of the second stage, the first of these elements is predominant; later,

the evidences of the other two make their appearance and herald the approach of its concluding and gravest phase. The indications for treatment are to be found in the above considerations. The supreme importance of the prompt treatment of cholera, or of any and every evidence of gastrointestinal irritation occurring during the prevalence of cholera, is well recognized; and the rules for its relief, by rigid diet, absolute rest, and the moderate use of opium and sedative astringents, are generally accepted. The conflicting theories of the *modus operandi* of the cholera-poison have led to confusion in regard to the management of the stage of discharge; and mischievous results have followed the application of some of the specific plans for its treatment based upon peculiar views of the significance of this symptom. Not one of these specific plans appears to merit approval. Those who have seen most of this dread disease seem most inclined to rational modes of treatment based upon sound general principles.

Among the most important of the general rules for the management of this stage of discharge, may be mentioned, the enforcement of absolute rest in the horizontal position, in a cool, well-ventilated, and disinfected room; the administration of small quantities of bland nourishing food at comparatively short intervals; the administration of fluid, even if portions of it are speedily rejected; the effort to maintain heat and circulation by external applications; the avoidance of stimuli, save in very minute quantities, freely diluted; the moderation of the discharges and the relief of the painful cramps by such remedies as the *mistura medica*, or *chlorodyne*; and the use of full doses of such drugs as bismuth, for the benefit of its local sedative and astringent action. Frequently, however, despite the most judicious and prompt treatment of this stage, the disease hastens on towards the condition of collapse. The discharges may, to a great extent, have ceased; but the alterations of the blood and the implication of the nervous system have advanced too far, and unmistakable evidences of collapse make their appearance. The most varied and contradictory plans have been suggested for the relief of this alarming state and the prevention of the deeper and hopeless degrees of collapse. The object of this little article is to suggest another plan, which it was my intention to have used had any cases of cholera come under my care this summer, and which I have now hastily written out, being at a long distance from home and from the present seats of the epidemic, thinking it might merit a trial. The demand in this state of approaching collapse, in addition to a continuance of the measures suited to the previous stage, is for some means of producing reaction and restoring to the blood its fluidity and properties which fit it for circulation. The effects of such measures as cold affusion or venesection are evidently but temporary and palliative, and do nothing towards the actual relief of the blood-lesion. Towards this end, the use of injections of warm saline solutions into the veins seems to contribute more directly than any other measure; and in the late epidemics of cholera

abroad, such injections have been employed with considerable success. They aid in restoring to the blood its bulk, fluidity, and saline property, and certainly produce in many cases a remarkable re-establishment of circulation. I can see no reason why the saline ingredient employed should not be dissolved in a dilute albuminous solution, so as to combine some nutritive value with the above-mentioned properties.

Being impressed with the large share taken by irritation of the sympathetic nerve in the production of the symptoms of collapse, and remembering the wonderful controlling influence exercised over some morbid states due to similar irritation (I refer chiefly to convulsion, whether epileptic or symptomatic) by large doses of the bromide of potassium, it has occurred to me that this drug might be of service in the stage of cholera we are considering; and, as it is impossible to secure the introduction of a sufficient amount by the mouth or enema, that it should be given by injection into the veins (grs. xlv in f3ij water, repeated at intervals of twenty minutes). Such a measure would probably secure the advantages of injections of other saline substances, and in addition it would enable this remedy to exert its full power over the state of irritation of the sympathetic nerve, which it so wonderfully controls under some other conditions.

I had intended, if any cases of cholera in this dangerous and too often fatal stage had presented themselves to me for treatment, to have fairly tried the use of large doses of bromide of potassium, given by injections, of such strength and in such quantities as experience has shown safe in regard to other salines.

COMPOSITION OF VALENTINE'S PREPARATION OF MEAT-JUICE.—BY WILLIAM H. TAYLOR, STATE ASSAYER, VIRGINIA.

Water	61.12
Organic substances	27.90
Containing uncoagulated albumen	1.11
Fat13
Creatin, creatinin, and other organic constituents of flesh-juice and blood	26.66
Inorganic substances	10.98
Containing chloride of sodium	1.42
Sulphate of potash52
Phosphates of iron, lime, and magnesia	1.21
Phosphates of potash and soda	7.83

—Virginia Clinical Record.

TREATMENT OF CHRONIC DISEASES OF THE BLADDER WITH INJECTIONS OF HEALTHY URINE (*Lancet*, May 10, 1873).—Dr. T. Clemens proposes injections of fresh and healthy urine in the treatment of old disorders of the bladder, such as catarrh, chronic inflammation, gravel, etc. A young and well-fed individual should be made to micturate directly and slowly into a syringe which has been warmed to 90° Fahr., and the urine should then be injected into the bladder, previously emptied and washed out with tepid water. This should be done twice or thrice daily. He has obtained good results in this way after having failed in the use of all known remedies.

PHILADELPHIA MEDICAL TIMES.

A WEEKLY JOURNAL OF
MEDICAL AND SURGICAL SCIENCE.

The Philadelphia Medical Times is an independent journal, devoted to no ends or interests whatever but those common to all who cultivate the science of medicine. Its columns are open to all those who wish to express their views on any subject coming within its legitimate sphere.

We invite contributions, reports of cases, notes and queries, medical news, and whatever may tend to increase the value of our pages.

All communications must bear the name of the sender (whether the name is to be published or not), and should be addressed to Editor Philadelphia Medical Times, care of the Publishers.

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SATURDAY, JULY 12, 1873.

EDITORIAL.

IN the mortality list of our issue of July 5 there is reported a death from sporadic cholera. Thinking it might interest our readers, we have written to Dr. W. H. H. Githens, and obtained the following report of the first case, closely resembling cholera, occurring in our city this summer:

"June 26, 1873.

"TO THE EDITOR OF THE PHILADELPHIA MEDICAL TIMES:

"Edward McN., a sober, industrious shoemaker, working at home, was somewhat depressed by the loss of a child, and the next day was himself taken sick with purging, vomiting, and cramps in the stomach and legs. The stools were liquid fecal matters at first. His wife gave him boiled milk and water to drink, and the subsequent passages consisted of diluted milk, with little or no change of color (alkaline in reaction). The matters vomited had the same appearance, and were not bitter.

"The next morning, on being summoned, I found the patient partially collapsed. I immediately administered morphia sulphate—gr. $\frac{1}{4}$ —hypodermically, and prescribed a mixture containing bismuth and morphia, to be taken at short intervals, with aromatic sulphuric acid to be added to the water which I allowed him to drink as soon as the morphia had quieted his stomach. There was no recurrence of either the purging, vomiting, or cramps after my first visit, but the skin did not return to a healthy condition. It remained cold (thermometer not used), cyanosed, shrivelled, and bathed in a profuse perspiration. The suppression of urine, which had been but partial before the use of the morphia, became complete afterwards; the voice remained whispering; the pulse soon became imperceptible at the wrists, and he died about sixty hours after the commencement of the attack.

"Shall we call this a case of cholera? There was no recognized source of contagion. The man and his wife and two children lived, worked, ate, and slept in one small apartment in the second story of a house in the most crowded section of the city. The room had windows on the north side only. The whole house was pervaded with a horrible odor from a privy-well immediately beneath it, and not provided with any chance of ventilation or any sewer connection.

"But these conditions, although favorable to the spread of cholera, are not recognized as being sufficient in themselves to originate it. On the other hand, we had all the symptoms of cholera,—watery discharges, free from odor, vomiting without bile, cramps in the stomach and limbs, suppression of the urine, loss of voice, intense thirst, great depression of temperature, failure of the heart's action, freedom from anxiety on the part of the patient, and the tendency to death not averted, although the prominent symptoms had been relieved sixty hours before that event occurred.

"Is opium contra-indicated by the tendency to suppression of urine? That symptom was more marked in this case after the use of the morphia than before; and I have noticed in one child that the secretion of urine is remarkably diminished by the use of paregoric."

We have not been able to obtain sufficient information at present writing to enable us to lay before our readers a sketch of the epidemic of cholera now prevailing in the West. It appears, however, to have been introduced from Europe into New Orleans, and to have spread in the usual manner along the routes of travel in the Mississippi Valley, reaching as far as Cincinnati, where, however, it has not attained any severity. It has been denied that the disease is true epidemic cholera; but, in view of the large number of deaths that have occurred, we do not see what else it can be; and Dr. B. W. Avent, of Memphis, Tenn., writes us that it is cholera. The epidemic appears to be subsiding, and from present appearances its reaching this neighborhood is problematical; although a second fatal case of disease exactly simulating cholera occurred here on July 6, in the same quarter of the city as that of Dr. Githens.

THE material for our columns relating to the subject of cholera has accumulated to such an extent that a single number would not suffice to contain it. We have for this reason divided the lecture of Prof. Stillé, as well as the leading article upon disinfectants. The concluding portions of them will appear in the next number of the journal.

AS we go to press, we learn that the cholera, or at least choleraic disease, has appeared in Jersey City.

LEADING ARTICLES.

DISINFECTANTS.

WITHIN the last two or three years a great deal has been written upon the subject of disinfectants, with the result of unsettling what was considered at one time a settled matter; but, in the doubt which remains, certain principles can be seen looming up and apparently shaping themselves into positive truths.

Chief among these is the folly of attempting to disinfect the atmosphere. It may be possible to decompose sulphuretted hydrogen in the air by chlorinated lime; although even this is somewhat doubtful. It certainly is possible to cover up one stink by another: and this is what is probably done with the saucers of chlorinated lime yet seen about some hospital wards in which antediluvian ideas prevail;* but we have learned that contagion is certainly not sulphuretted hydrogen, any more than it is a bad smell, for the worst odor may exist without contagion, and the most deadly contagion may lurk in a fluid or an atmosphere free from odor.

Contagion appears to be one of two things,—organic alkaloids or other compounds of some sort, or else living germinal matter, animal or vegetable.

It is self-evident that a substance chemically powerful enough to disorganize organic compounds must be inimical to human life,—that a material sufficiently powerful to kill germinal matter of low organization must be destructive to germinal matter highly specialized and therefore highly sensitive.

It follows that any atmosphere capable of supporting human life is incapable of destroying contagion.

An efficient disinfection of a room, its atmosphere, and the furniture in it, certainly cannot be carried out with any person in the apartment. If it can be done at all, it will be by adopting the following plan:

Take a large iron pot† or caldron, put in it a little stand, such as the cheap tripod used by chemists, place on this an iron plate containing flowers of sulphur thoroughly wet with alcohol or (probably better still) with turpentine; underneath the plate set a tin alcohol lamp; then put the whole on bricks in the middle of the room, whose chimney, doors, and windows have been closely sealed, the drawers, closets, etc., having been widely opened. Light the lamp underneath the dish, and if the sulphur do not take fire previously, when it begins actively to melt, ignite it. Leave the room at once, closing the door. Unless the apartment become densely filled with the fumes, far beyond what could be supported by a human being, the attempt at disinfection cannot be of any service.

* By concealing the more apparent effects of bad ventilation, these so-called disinfecting saucers are really worse than useless: they actually do harm, and should be banished from the sick-chamber. The attempt to purify the air by means of them reminds one strongly of the wrath of Mrs. Partington when the Atlantic Ocean rose against her, and of her well-directed efforts to sweep it back with a broom.

† As this article is written for sensible people, it is not necessary to lay any stress upon the pot being large enough, and upon other precautions being used to avoid the risk of fire.

Even when this method of disinfection is carried out most thoroughly, it is still uncertain how completely the chamber is disinfected: to rely upon it to the exclusion of free, thorough ventilation afterwards, would be the sheerest folly.

It is evident that for ordinary purposes the only method of disinfecting an apartment is to be found in ventilation,—a dilution of the contaminated atmosphere by pure air until the point is reached at which the contagion is too slightly concentrated to affect human beings.

The question now arises, What is the province of disinfection? and the answer evidently is, To alter the constitution of liquids and solids.

We think here it is necessary to pause to get clear ideas about a matter which has been strangely confounded.

The cholera is approaching: the cry is to disinfect the cesspools. The cholera is here: the cry is to disinfect the discharges. It is evident that the objects to be gained in the two cases are different. There are no "contagion germs" in the cesspools, but putrefying organic matter. There is no putrefying organic matter in the cholera discharges, but a poison to be destroyed,—a poison whose nature is not known but is believed to be connected with life.

The point I want to make is that before the subject of disinfection can be made perfectly clear it is necessary to keep in view the two different results to be achieved, namely, the prevention of putrefactive fermentations in organic matter, and the destruction of germs already existent.

Having a distinct idea of what we desire to do, it is next in order to determine what we have to do it with.

Dr. Jeannel (*L'Union Médicale*, tom. xii.) arranges the disinfectants as follows:

1. *Oxidizing Agents*—air, oxygen, ozone, hyponitric acid.
2. *Dehydrogenizing Agents*—chlorine, hypochlorites, iodine, bromine.
3. *Deoxidizing Agents*—sulphurous acid, sulphites, hyposulphites.
4. *Desulphurating Agents and Coagulators of Albuminous Matters*—lime, salts of alumina, of zinc, of lead, of iron.
5. *Antiseptic Agents*, which kill germs—carbolic acid, its congeners and substances containing it, thymic acid, etc.
6. *Absorbing Agents*—charcoal.

It would not be difficult to make objections to this classification. Thus, the chief value of sulphurous acid as a disinfectant appears to depend upon its power of killing the low forms of life. It is, therefore, an antiseptic, and the possession by it of any powers beyond this is somewhat doubtful. Still, the classification is sufficiently accurate for practical purposes; so that we may take it for our guide in studying the subject of disinfecting putrefying matter. The method which nature employs for purification, as in water containing organic material, is by oxidation; and it seems as though in our present state of uncertainty the only

disinfectant worthy of absolute trust would be an agent capable of entirely oxidizing organic matter. Fire is such an agent; but it is too destructive, and often not readily applicable.

Permanganate of potash possesses the power of oxidizing dead organic matter freely; but, as every one knows who has applied it to a raw surface, its action on living tissue is feeble; and, according to Carmao-Dumenez and Demarquay, portions of lungs and liver immersed in a concentrated solution of the salt undergo putrefaction. I am not aware that experiments have been made as to its power of destroying living animal germs; and when to these facts are added its costliness and the large amount of it required for any service, because it uses its own oxygen only in the destruction of organic matter, it becomes evident that its practical value is slight. The same remarks apply in a still more forcible manner to the other substances in class No. 1.

In regard to the second class of substances, chlorine, in the form of chlorinated lime, is the only one worthy of attention; the extreme costliness of the other preparations renders them of no practical value. Chlorinated lime is certainly a very rapid and effective disinfectant, especially in regard to sulphuretted hydrogen. Its odor is, however, only a little better than that of the latter compound, and proof seems wanting that it acts with equal rapidity and effectiveness upon organic matter. Its comparative costliness and its bad odor certainly prevent its occupying the first rank as a disinfectant for uses such as we are now speaking of.

The third class of substances are far too costly for use as preventives of putrefaction on a large scale.

Lime, the first substance in the fourth class, is probably the oldest of all the disinfectants, and in some respects is efficient, although on the whole its general use is to be reprobated. It does not act merely as a desulphurating and coagulating agent; it, like the other strong alkalies, causes catalytically a slow oxidation of organic matter. Thus, ozone of itself will not oxidize olein, but if potash be added to the mixture the reaction commences at once; and it is notorious that a compost-heap which has lime in it rots—i.e. oxidizes—much more rapidly than one which has none of the alkaline earth in it. This action of lime is, however, too slow for ordinary purposes: moreover, there are very serious objections to its use as a disinfectant.

The poisonous principles contained in sewage, etc., whatever their nature may be, are probably volatile, and lime, acting as a strong base, sets free large quantities of ammonia in animal matter undergoing decomposition. It may be that volatile poisons, alkaloids, are liberated with the ammonia; but, whether they are or not, it is a well-known physical fact that a volatile substance in escaping carries off with it even non-volatile materials, and facilitates to a still greater degree the escape of principles only less volatile than itself.

Our choice of disinfectants for sewage, privies, etc., is therefore narrowed down to the fourth and fifth classes.

Owing to its much greater cheapness, the impure sulphate of iron—*copperas*—is by long odds the most avail-

able of the substances of the fourth class. The question of the comparative value of it and carbolic acid admits of not a moment's debate. The comparatively extreme dearness of the latter agent, its horrid odor, and its very marked poisonous properties, would forbid its use were it vastly more effective than the iron salt. In truth it is not. There is no reason for believing that carbolic acid affects any compounds formed before it is used; it certainly does not decompose sulphuretted hydrogen; it simply arrests decomposition by acting as a parasiticide, and when from any reason the percentage of it in a solution containing organic matter becomes reduced below a certain point it leaves the organic matter free to recommence putrefaction. Not so with copperas: it is antiseptic, but it also decomposes sulphuretted hydrogen, precipitating sulphide of iron; it is decomposed by ammonia, the oxide of iron, a persistent, powerful oxidizing agent being precipitated; it slowly but persistently attacks organic matter about it, oxidizing it and being reduced to a sulphide of iron. As copperas is very cheap, theoretically, it is the most efficient and valuable of the disinfectants, and practical use has shown, its price being considered, that it is the best. The common mistake is in not using it in sufficient quantity. At the ordinary drug-stores it is sold for from seven to fifteen cents a pound; and twenty-five pounds of it seems a great deal to the purchaser. Professor Genth, however, informs me that by the quantity impure copperas can be bought for seven-eighths of a cent a pound; and at this price in time of a cholera epidemic our streets should be watered with its solution.

The value of sulphate of iron does not rest, it must be remembered, upon theory only, but also upon experiment. In the *Zeitschrift des Oester.-Apothek.-Vereines*, February 10, 1873, Albert Eckstein published an account of his attempts to disinfect a privy which was used daily by one hundred persons, and the results are so interesting that they are here transcribed:

1. Two pounds of sulphate of iron in solution. After from two to three hours all bad smell had disappeared, but in twelve hours all the influence of the disinfectant was lost.
2. Sulphate of copper in solution, the same.
3. Two pounds of sulphate of iron in crystals; their effects lasted two days.
4. Sulphate of copper, the same.
5. Sulphurous acid in solution rapidly lost its effect, and was exceedingly irritating to the respiratory organs.
6. Two pounds of impure carbolic acid filled the house for two days with such a disagreeable smell that it was impossible to tell whether the original odor was destroyed or covered up.
7. Two pounds of sulphate of iron in a parchment sack exerted a disinfecting influence for three full days, and when the parchment sack was drawn up it contained only some dirty, odorless fluid.
8. Two pounds of the best chloride of calcium in the parchment sack disinfected the privy for at least nine days.

H. C. W., JR.

(To be continued.)

SELECTIONS.

A CERTAIN SIGN FOR THE RECOGNITION OF CHOLERA IN THE EARLY STAGE.

DR. A. HERMANN has a paper upon this subject in the June number of the *Allgem. Wien. Med. Zeitung*, which is translated in *The Clinic* of June 28:

"All authors are agreed that the first urine after the collapse differs markedly from normal urine in containing albumen, cylinders, hyaline and granular, in abundance, and writers are tolerably unanimous in the opinion that the danger of the typhoid stage is due to the kidney disease which is thus developed.

"The discovery of the author consists in the detection of albumen cylinders and epithelium in the urine during the time of the precursory diarrhœa. If the examination of the urine show negative results, cholera will not ensue. The author has had now forty-eight cases in which to establish his discovery as a fact. In no one of these cases has he been deceived in his prognosis. It is very true that in *stadium asphycticum* little or no urine at all can be obtained for testing purposes; yet if catheterization be regularly practised (and it should never be omitted in cholera) enough may be obtained at some time for chemical and microscopical examination. The author does not claim priority in the discovery of albumen in the urine of cholera collapse. Simon and Hermann called attention to this fact in the third decade of the present century. The author's claim consists in the discovery of albumen in greater or less quantity during the stage of the 'diarrhœa premonitoria.'

"Should an individual in health be suddenly attacked with diarrhœa, even during a cholera epidemic, and should on examination no albumen be found in the urine, cholera will not develop, not even if the individual be in such a position that he cannot protect himself in any way. Such a diarrhœa may even be maltreated and still it will not lead to cholera, but will resolve itself in time, even though it may have reached such a grade as to have been called cholera or even cholera.

"But if albumen be found in the urine of an individual suffering with diarrhœa—with cylinders and kidney epithelium under the microscope—still the diagnosis of cholera is not absolute of course, as other affections may bring about this condition; yet as this manifestation is constant and never failing in cholera, as the collapse and typhoid condition are only observed in this condition, such a diarrhœa is to be diagnosticated as cholera when the other affections productive of albuminuria are excluded.

"It matters not whether the symptoms be light or severe, when albumen presents in the urine it establishes the existence of true cholera, and the graver symptoms will manifest in a short time.

"The author concludes his paper as follows: New observations have only confirmed me in the opinion before expressed that 'however severe and apparently choleraic the symptoms may be, the disease is not to be considered as true cholera if albumen be absent in the urine; on the other hand, the most anxious attention is to be directed to a case even in the earliest diarrhœa when the urine is albuminous.'

MISCELLANY.

FRECKLES, it is said, are removed by the application, twice a day, of powdered nitre moistened with water.—*Southern Med. Record*.

ACTION OF THE BROMIDES IN PRURIGINOUS AFFECTIONS.—Dr. Guéneau (de Mussy) extols the efficacy of the bromides applied locally in pruriginous affections of the external and internal integuments. He recommends their use especially in pruritus vulvæ. He employs the bromides either in ointment or solution.—*Druggists' Circular*.

A NEW HYGROMETER, made in Paris by G. Smith, consists of strips of paper dipped in a cobalt salt solution containing common salt and gum Arabic. In dry weather it is blue, and in wet rose-red.

WEEKLY RETURN OF DEATHS AND INTERMENTS IN PHILADELPHIA FOR THE WEEK ENDING SATURDAY, JULY 5, 1873.

DISEASES.	Adults.	Minors.	DISEASES.	Adults.	Minors.
Abscess.....	1	1	Fever, Typhus.....	1	1
Anæmia.....	1	1	Fracture of the Thigh....	1	1
Apoplexy.....	5	1	Hemorrhage.....	1	1
Asthma.....	1	1	" from Lungs.....	1	1
Burns and Scalds.....	3	1	" " Stomach & Bowels.....	2	1
Cancer.....	1	1	" " Uterus.....	1	1
" of Uterus.....	4	1	Hooping-Cough.....	1	3
Casualties.....	4	1	Inanition.....	1	7
Cerebro-Spinal Meningitis.....	4	3	Inflammation of Brain....	2	7
Child-Bed.....	1	1	" Bronchi.....	2	2
Cholera Infantum.....	83	1	" Heart.....	1	2
" Morbus.....	1	1	" Liver.....	1	1
" Sporadic.....	1	1	" Lungs.....	3	7
Cirrhosis of Liver.....	2	1	" Peritoneum.....	1	3
Congestion of Brain.....	3	2	" Pleura.....	1	1
" Lungs.....	1	1	" Spine.....	1	1
Consumption of Bowels....	36	2	" Stomach & Bowels.....	4	2
" Lungs.....	1	17	Intemperance.....	1	1
Convulsions.....	1	1	Jaundice.....	1	1
" Puerperal.....	1	1	Mania a potu.....	1	1
Cramps.....	1	1	Marasmus.....	2	7
Croup.....	3	1	Neuralgia of the Heart....	1	1
Cyanosis.....	1	1	Old Age.....	5	1
Debility.....	5	10	Paralysis.....	4	1
Diarrhœa.....	3	7	Pyæmia.....	1	1
Diphtheria.....	1	1	Scrofula.....	1	1
Disease of Brain.....	1	1	Smallpox.....	2	1
" Chest.....	7	1	Softening of Brain.....	4	1
" Heart.....	1	1	Still-Born.....	11	1
Dropsy.....	1	1	Suicide.....	2	1
" of Brain.....	5	1	Sunstroke.....	1	1
Drowned.....	6	2	Syphilis.....	1	1
Effusion on Brain.....	1	1	Tabes Mesenterica.....	1	1
Epilepsy.....	2	1	Teething.....	1	1
Erysipelas.....	1	1	Tetanus.....	1	1
Fatty Degene'n of Liver....	1	1	Ulceration of Throat.....	1	1
Fever, Hætic.....	1	1	Wounds, Gunshot.....	1	1
" Puerperal.....	1	1			
" Scarlet.....	8	1			
" Typhoid.....	1	1			
TOTALS.....	143	213			

METEOROLOGICAL OBSERVATIONS TAKEN AT THE SIGNAL OFFICE, PHILADELPHIA, DURING THE WEEK ENDING SATURDAY, JULY 5, 1873.

Month and Day.	Barometer. Daily Mean.	Thermom. Daily Mean.	State of Weather.	Rain. In.
JUNE.				
Sunday.....29th	29.83	75	Cloudy, Fair.	.10
Monday.....30th	29.80	75	Cloudy, Fair.	.05
JULY.				
Tuesday.....1st	29.89	78	Lt. Rain, F'r, Cl'r.	.60
Wednesday.....2d	30.09	81	Clear, Fair.
Thursday.....3d	30.02	83	Clear, Threatening.
Friday.....4th	29.94	85	Fair, Clear.	.01
Saturday.....5th	29.82	79	Cloudy, Fair, Clear.
Means.....	29.91	79		.78

The surface of the cistern of Barometer is located 71.92 feet above the mean level of the sea.

Barometer corrected for temperature, elevation above sea, and instrumental error.